

their effects upon the weather conditions will show their importance from the forecasters point of view.

A high, from the time it first appears, moves in a general easterly direction over well known tracks, with a velocity dependent upon the conditions surrounding it. Sometimes, however, its movement is so sluggish as to be hardly perceptible, and it hangs over a section of the country with a persistency that both surprises and confuses the forecaster. These cases are rare, and one noticing a high charted on this morning's weather map may look for it tomorrow at a point farther east, and so on, until it moves out of range of the Weather Bureau stations.

An area of high pressure when once formed can be counted upon to last for some time. This being so, and from the fact that air is continually flowing out from all sides as surface winds, it is evident that to maintain its characteristics air must be supplied from some source in proportion to that which flows out. Hence it would seem that in the higher strata of the atmosphere air must be moving inward and sinking downward, thus making it reasonable to believe that the pressure in the upper regions of the air is least above the spot where it is greatest on the earth's surface.

During the summer months areas of high pressure are characterized by dry weather; the days are warm, bright, and cloudless. The nights are cool, with clear and brilliant skies; and, as the dry air aids radiation from the earth's surface, the temperature quickly cools to the dew point, and heavy deposits of dew occur, and sometimes frost. Under these conditions the daily range of temperature is generally much greater than at other times.

Areas of high pressure during the winter months are more decided in their characteristics; they move with greater speed, and as the days are short and insolation weak, they are generally attended by low temperatures. Cold days and colder nights prevail.

The blizzards that sweep with icy breath over the west and

northwest, the marrow-chilling northers of Texas, and all the cold waves are first located within areas of high pressure, and, as they advance with the frosty breath of colder climes, the forecaster notes their position and studies their progress.

As has been stated, the low is the opposite of the high, and it plays an equally important part in our weather changes. The air in the center of an area of low pressure being rarer, and consequently lighter than under ordinary conditions, tends to disturb the equilibrium of the surrounding air, causing it to expand and rush toward the low.

The term "cyclone" was originally applied to lows and storm areas for the reason that it was believed the wind blew around them in circles, but since the science of meteorology has advanced it has been demonstrated that the wind blows in toward the low's center in a spiral curve with a velocity dependent upon the gradient or steepness of the depression. As the center of an area of low pressure remains the lowest in spite of the fact that the surface winds are pouring in from every direction, the logical deduction is that the air must rise around the center and flow out from above, thus making an inward and upward whirl, or eddy, of the atmosphere. The eddy, however, is not stationary but is always moving, sometimes increasing in strength as it advances and again spreading out and becoming less intense.

The weather changes associated with a low are proofs of its being an eddy of ascending air from the fact that on its approach clouds are formed, the temperature rises, and often rain, accompanied by high winds, occurs. Then comes clearing weather, a sudden shift of wind, and a sharp rise of barometer, all showing that the storm has passed and that a high, with its quota of fair weather, will soon move in and assume control.

Like the restless billows of the ocean, the atmosphere is ever surging, and pursuant to the wise and economic laws of nature, compensates us with clear and sunny skies for the days that were dark and dreary.

NOTES BY THE EDITOR.

ORIGIN OF DESCENDING GUSTS OF WIND.

Mr. Charles A. Love, voluntary observer at Aurora, Ill., writing with reference to a storm at Laurelwood Park, 1 mile north of Batavia and 8 miles north of Aurora, suggests an experiment that might be carried out on a small scale in a laboratory, if any of the physicists who have the necessary conveniences at hand would kindly devote so much attention to meteorological problems. Mr. Love says:

A visit to the place showed that a hard windstorm from the southwest had swept through the grove at Laurelwood Park in the afternoon of August 28, and that the damage had been confined for the most part to a limited portion of the natural grove of tall black oaks of about a quarter of a mile in extent each way. * * * The branches of the trees fell toward the northeast, and the roof of the dancing pavilion was pushed eastward. If the wind had been a lifting one it should have carried the roof clear of the floor, but it did not do so, and in this case as in others where hail falls, the wind appears to have been crushing instead of lifting. Reports from Kaneville, about 12 miles southwest from Laurelwood Park, report a wind, rain, and hailstorm at 5:25 p. m. from the southwest. First, there was a cold gust from the northwest, and then the wind veered to the southwest. Is it possible for a stratum of cold dry air to get in between an upper and lower rain cloud and freeze the rain from the upper cloud while falling through the cold dry stratum, if such a stratum be between 800 and 2,500 feet deep? I should like an opportunity to let water drops fall from some very high building and observe how great a falling distance and how low a temperature of the air is required to produce hail. The downward rush of cold air displacing the hot air at the surface of the ground appears to account for the peculiar crushing and pushing of the wind in the storm at Laurelwood.

Approximate calculations of the power of cold rain and

hail to cool the air and cause it to descend are said to show that only gentle winds can be formed in this way. The Editor hopes that well-devised experiments may be instituted in order to test these calculations. The subject is too difficult and too important to meteorology to be settled by crude estimates.

THE POSTAL TELEGRAPH CLOCK AND WEATHER BULLETIN.

According to the Electrical Engineer of September 2, the Postal Telegraph Cable Company is in cooperation with the United States Time and Weather Service Company of New York, and is making rapid headway in the establishment throughout the city of tall handsome clocks which shall exhibit standard time, not only by the face of the clock but by the dropping of a time ball at noon, so that "Postal Time" is already becoming a standard well-known phrase. These clocks have been set up already in many western cities also, and will undoubtedly meet a popular want.

The clock is within a case about 18 feet high, which is surmounted by a short staff supporting a wind vane, and down which a gilded ball drops about 3 feet each day at noon. Over the clock dial is the name of the "Postal Company." Under the dials are large panels about 18 by 63 inches, which are filled up with local and special advertising. Beneath these are smaller panels which give each morning the latest Weather Bureau reports and forecasts two or three hours be-

fore they appear in the afternoon papers. At the corners of the stand, on the street side, are a thermometer and a barometer. The clock stands are made of cast iron, bolted securely to the sidewalk paving. Arrangements are made, when necessary, to illuminate by electricity the clock faces and the advertising panels. The whole arrangement reminds us of the so-called Urania Columns established by the Urania Gesellschaft in Berlin, and they will doubtless be as popular in America as they have become in Germany.

ELECTRIC WAVES IN THE ATMOSPHERE.

In the MONTHLY WEATHER REVIEW for November, 1896, XXIV, p. 409, there are some remarks by Prof. John Trowbridge on the possibility of detecting the transmission of electric waves from the sun to the earth. All wave phenomena have certain points of analogy. Our eyes and ears are simply machines for catching optical and acoustical waves; as a tide mill can be arranged to abstract power from the ocean waves, so, also, the electric current may be treated if it behaves like a wave-like phenomenon. The flow of a current of water thrown into waves by an obstacle is analogous to the flow of electricity. The following remarks are taken from a report by Charles de Kay, United States consul-general at Berlin, in the consular reports for September, 1897:

The electrical waves are not believed to be vibrations in the air itself, but rather in the ether between the particles of air; as compared to light waves, they are of enormous size.

That the electric waves do in many ways act like light rays, though they are much longer, I saw recently demonstrated in a lecture I was permitted to attend at the Polytechnic School in Charlottenburg, Berlin. To get some idea of the relative size of electric waves when compared with those of light, imagine that the light waves are represented by the width of the Hudson River at New York City; then the electric waves would be represented by the Atlantic Ocean and Baltic Sea, say from New York to St. Petersburg, or, to express it acoustically, the waves of light are so high and sharp, while those of electricity are so long and deep, that the light waves may be compared to the highest, shrillest sound which the human ear can grasp, while those of electricity are comparable to the deepest diapason note of an organ.

The lecture alluded to was one which Professor Rubens, a young German of Dutch descent, now employed as instructor at the Polytechnic, recently gave to a number of teachers. Since Herz's death, in 1888, he said, much progress has been made in reducing the size of the electric-wave generator. As the size of the apparatus has a relation to the length of the electric waves, and as it was desirable to shorten these waves, the decreased size of the apparatus has been of use in making air telegraphy more practicable. Shorter electric waves are more approximate in their action to waves of light and go farther. Up to the present the shortest are those of the Russian experimenter, Lebedeff, who has produced them from 6 to 7 millimeters long. Professor Rubens showed a thermo element, or heat catcher, invented by himself to take the place of Marconi's coherer, which, like the coherer, catches the refracted and focused electric rays. The spark, he observed, was not at all a necessary phenomenon in electricity. He then made many curious experiments to show the similarity in action of waves of light and waves of electricity, and also drew attention to the very different way in which electric and light waves pass through different substances; thus, he reflected electric waves like light, refracted them with prisms, and diffracted them with a wire grating of parallel wires, as light is diffracted by Rowland's gratings. He then showed the polarization of these rays, freely through the fibers of wood longitudinally and badly across the fiber, easily through closed books with the leaves and with difficulty across the leaves. Thus, a pile of books or sheets of glass showed polarization like crystals under light. He showed, also, that, on account of the length of these waves, their energy was absorbed differently by different substances; thus (1), water absorbs all the energy, (2) metals absorb all the energy, (3) glass absorbs nearly all, (4) paraffin absorbs hardly any, and (5) hard rubber absorbs hardly any. Thus, they move through hard black rubber and paraffin as light moves through air, glass or water—that is to say, with hardly any resistance—while glass lets very little of them through, and metal and water are impervious to them.

Professor Rubens imbeds his Herz generator in petroleum [paraffin?] for better isolation; and as a handy concentrator of the electric waves uses a round glass bottle filled with petroleum. By placing in turn the glass prism, wire grating, block of wood, pile of books, water, paraffin, and hard rubber in the line of the unseen electric waves pouring from the generator and concentrator toward the wave catcher, he showed on an indicator the easy or retarded passage or the entire interruption of the unseen flow of electric waves.

ELECTRICAL DISTRICTS.

Under date of August 29 Dr. Albert A. Banks sends a diagram showing that within 120 feet of a small house near Columbus, Ga., lightning has struck either house or trees six times during the past fifteen years, the distances being, respectively, 9, 10, 10, 14, 25, and 40 yards, and he asks whether such frequency within such a small area is not unusual, and if there is any significance in this play of the lightning.

We regret that we have not any statistics at hand that will show clearly the average number of strokes per square mile for fifteen years in that part of Georgia, and, therefore, whether this is an unusual case. The testimony of Dr. Banks' neighbors would be more valuable than any theory or opinion of ours. If neighboring houses have not had a similar experience, then there must be some significance in this one; but what that may be, whether it is in the topography or in the underground water, or in the concentration of the paths of thunderstorms, we would not pretend to suggest. We publish this query in the MONTHLY WEATHER REVIEW in hope that some observer near Columbus, Ga., may furnish other cases of similar lightning frequency, so that we may have data enough to elucidate the question.

LIGHTNING AND MAGNETIC ROCKS.

Prof. F. Pockels, of Dresden, communicates to the new annual (*Jahrbuch für mineralogie*) an argument in favor of the idea that the magnetism observed in almost every stratum of rock, and most of all in the so-called magnetic iron ore, has been produced therein locally by the lightning, or in mountain regions by the perpetual discharge of atmospheric electricity. He says that the magnetic rocks occur in exposed places that protrude prominently above the flat country, and that the north and south poles in these rock masses occur in a perfectly irregular interchangeability, often within very short distances, such as a few centimeters, so that their magnetism can not be due to the inductive action of the earth's magnetic field, as was supposed by Melloni. The latter may have an influence, but it is too feeble for ordinary observation.

In connection with Toepler, Pockels has made a number of experiments on the effect of electrical discharges upon various kinds of stone. Some of these show no magnetism, others become magnetic and rapidly lose that condition, while still others become strongly and permanently magnetic, so that in general he concludes that all forms of stone which show permanent magnetism in natural exposed localities also become magnetic when subjected to the artificial electric spark, so that it is almost certain that the discharges of atmospheric electricity are the cause of the natural magnetism of magnetic stones.

Pockels' conclusion seems to be confirmed by the fact that Professor Barus found no magnetic ore in the deep mines, and no earth currents when he explored them. The almost continuous earth currents in northern countries, such as attend auroras, may have as strong an influence as the lightning of the tropics.

THE STRUCTURE OF HAILSTONES.

In Bauer's new Annual for Mineralogy, published at Stuttgart, Vol. I, page 259, Prof. F. Rinne gives an interesting description of some peculiar hailstones that fell at Hannover on the 9th of January, 1897, as follows:

After many days of cold, extending down to 10° C. without precipitation, there fell at Hannover on January 9, with rising temperature, an abundance of snow, which occasionally disclosed its compact structure by the characteristic rattling noise of falling hail, and especially by blows of the particles of ice on the window panes of the room. The falling of such snow-ice could also be observed after the precipitation